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UREDINALES OF PORTO RICO BASED ON COLLECTIONS BY H. H. WHETZEL AND E. W. OLIVE

J. C. ARTHUR

A botanical expedition was made to Porto Rico in the spring of 1916 by Professor H. H. Whetzel, of Cornell University, and Dr. E. W. Olive, of the Brooklyn Botanic Garden. They reached the island on February 23, and left it on April 26, permitting thus about two months of uninterrupted work. All kinds of plants were collected, but especial attention was given to fungi, and a generous portion to the Uredinales. As a result of their labors 383 numbered collections of Uredinales were secured and shortly afterward submitted to the writer for study. The 383 collections were found to represent 122 species, as now understood, and these are systematically treated in the following pages. The writer and the scientific public are under large obligation to the collectors for their assiduous and painstaking labors, and for their generosity in turning over to another the whole set for unreserved examination and record.

A unique and most fruitful part of the work of the collectors was a careful and adequate test of the mode of germination of all so-called species of *Aecidium*, made at the time they were found. The new methods of testing the behavior of spores on solid substrata or on water surfaces were used. From the results it was learned that four forms, heretofore considered aecia and supposed to belong to heteroecious species, and another similar form but unrecorded for the island, were in reality aecidioid telia representing short cycle species, while five other similar forms were undoubtedly to be considered heteroecious aecia. The full morphological and incidentally taxonomic study pertaining to this part of the subject has been published by the collectors (*Am. Jour. Bot.* 4: 44. 1917).

In connection with observations on the aecia-like species care-

ful search was made in the field for clues that might lead to the discovery of alternate forms for the true aecia. In two cases most promising indications were detected. *Aecidium passi-floriicola* was found a number of times so intimately and exclusively associated with *Puccinia Scleriae* that little doubt seems to remain regarding their genetic connection. Living host plants for both rusts were sent to Lafayette, Indiana, and apparently good telial material for cultures, but the teliospores could not be made to germinate, and no cultures were secured. *A. tubulosum* was also taken intimately associated with *Puccinia substriata*, but this connection also needs confirmation by cultures. It is a curious situation that with only five or six true unattached aecia that may be considered heteroecious, there are some twice as many species of grass and sedge rusts on the island, which produce telia in sufficient abundance to indicate that they may occasionally complete their life cycle with aecia. Most of the grass and sedge rusts of Porto Rico, however, evidently reproduce in that region only by uredinia.

It is interesting to note increased results obtained by systematic efforts in collecting a certain class of plants. If we compare the collections obtained by Clinton (1904), Holway (1911), Stevens (1913 and 1915), and Whetzel-Olive (1916), all by well-informed uredinologists and excellent observers, it will be noted first that the two later sets contain about five times as many species as the two earlier sets. This is accounted for in part by the length of time employed. But the two earlier collectors evidently did not see many rusts in the field to collect, while Stevens required nearly two years to secure as many species as Whetzel-Olive obtained in about two months. All these collectors came to the island without direct knowledge of tropical vegetation, and did not know the plants by name. Thus the published list of the Stevens collection, which Whetzel and Olive had in their possession, did not help much at the time, because for the most part they were not able to recognize the plants at sight to which the names applied. It is highly probable that the difference in results can largely be accounted for by a gradual, and quite likely, unconscious recognition of a marked difference between the macroscopic appearance of the majority of tropical rusts and those of

temperate regions. The generally applanate or pulvinate, strongly colored sori of most rusts of northern regions, render them far more conspicuous than the protected, pale sori, sunken in the tissues or surrounded by paraphyses, more common in the tropics. A growing recognition of this difference led more and more to a search for the inconspicuous, so-called *Uredo*-forms on plants of pronounced tropical appearance. In this way each of the two later sets presented a long list of forms that at first could only be classed under the form-genus *Uredo*. In the Stevens list were 37 such forms, which by careful microscopic study were assorted into 18 forms that could be labelled with published names, 14 that needed to be described as new, and 5 with which other spore forms could be found which permitted them to be placed under true genera. In the Whetzel-Olive list are 31 such forms (exclusive of 3 reduced to synonymy in the Stevens list), which have been assorted into 22 previously known, 4 new, and 5 placed under permanent genera. These figures do not include new or old species where the collections showed little or no other form beside uredinia, but which are generally and readily referred to true genera, such as *Uromyces appendiculatus*, *Puccinia Leonotidis*, and the species of *Coleosporium*.

Although the Whetzel-Olive set contains the same number of species as the Stevens set, allowing for the reduction of some species to synonymy, yet they are not wholly duplicates, as each shows 27 species not found in the other. The Whetzel-Olive material has added 25 species to the recorded rust flora of Porto Rico, 11 of which are new to science, beside permitting the erection of 3 new genera, the arranging of 10 new combinations and bringing to light of many new hosts for previously known species. There are 157 species of Uredinales now reported for Porto Rico, exclusive of *Hemileia vastatrix* B. & Br., the Asiatic coffee rust, which is dropped from the list because it is believed to be exterminated from the island.

The Whetzel-Olive set provided additional spore-forms which permitted the removal of *Uredo concors*, *U. capituliformis* and *U. fallaciosa* from the form-genus *Uredo* to their proper generic positions, and in so far assisted in the slow process of classifying the host of tropical rusts ordinarily found only in the repeat-

ing spore stage. Some advance was made in the case of another form, *Uredo Plucheae*, by the discovery of aecia associated with the uredinia, but telia must be found before the true generic position is assured. Material was also provided, which permitted the assignment of two *Uredo*-forms to a genus of striking and highly distinctive characteristics. This new genus is dedicated to one of the collectors in recognition of his important contributions to the fundamental understanding of the evolution of the Uredinales, and also as a tribute to the notable success of the expedition.

As the present paper may be considered in a way a continuation of the Porto Rican rust flora, as begun in the report on the Stevens collections (MYCOL. 7: 168-196, 227-255, 315-332; 8: 16-33. 1915-16), the same form of treatment has been used as in that paper, but with omission of both citation and synonymy for both the rusts and hosts appearing in that list. For species not occurring in the Stevens list, however, citations and synonymy are given. When a species is listed here under a different name than in the Stevens list, it is followed by the previously used name in parenthesis without citation.

Family: **Coleosporiaceae**

1. COLEOSPORIUM ELEPHANTOPIDIS (Schw.) Thüm.

ON CARDUACEAE:

Elephantopus mollis H. B. K., Mayagüez, Feb. 29-Mar. 6, II, 151.¹

2. COLEOSPORIUM IPOMOEAE (Schw.) Burr.

ON CONVULVULACEAE:

Ipomoea angustifolia Jacq., Campo Allegra, April 21, II, 306.

Ipomoea Batatis (L.) Lam., Barceloneta, April 6, II, 304; El Yunque, April 14, II, 303, 305.

Ipomoea rubra (Vahl) Millsp., Rio Piedras, April 11, II, iii, 309; El Yunque, April 14, II, 308.

Ipomoea stolonifer (Cyrill) Poir., Santurce, April 24, II, 307.

¹ All numbers of the Whetzel-Olive set are collections made in the year 1916.

Jacquemontia tammifolia (L.) Griseb., Añasco, March 28, II, 242.

3. COLEOSPORIUM PLUMIERAE Pat.

ON APOCYNACEAE:

Plumiera alba L., Guanica, March 30, II, 299.

Family: Uredinaceae (Melampsoraceae)

4. PHYSOPELLA VITIS (Thüm.) Arth.

ON VITACEAE:

Vitis vinifera L., Maricao, March 22, II, 347.

5. Physopella Meibomia sp. nov.

ON FABACEAE:

Meibomia supina (Sw.) Britton (*Desmodium supinum* DC.), Añasco, hillside, March 28, II, III, 219 (type); Tanamá River Valley, April 7, II, 275.

Uredinia hypophyllous, scattered or somewhat aggregated on discolored areas, small, about 0.1 mm. across, at first punctiform, pale, subepidermal, opening by a pore about which the spores accumulate; paraphyses imbricated to form a pseudoperidium, small, incurved, clavate, 7–10 by 26–64 μ , the wall colorless, thin, slightly thicker above; urediniospores globoid or broadly obovoid, 13–19 by 19–23 μ ; wall colorless, thin, 1–1.5 μ , very closely and finely echinulate, the pores obscure.

Telia hypophyllous, associated with the uredinia, inconspicuous, giving no surface indication, subepidermal, lenticular, small, about 0.1 mm. across and one half as high; teliospores smooth, composed of 2–3 cells in series, the outer cells larger, irregularly oblong, 9–12 by 13–19 μ , the wall thin, 1 μ or less, somewhat thicker above, 2–2.5 μ , pale cinnamon-brown, becoming dark cinnamon-brown above, the inner cells globoid or ellipsoid, paler, not thickened above.

This inconspicuous species differs in its uredinia very little from a collection of unnamed uredinia on *Desmodium heterocarpum* from Ceylon, sent the writer by Mr. T. Petch, government mycologist, and may be the same. No other similar collection has been seen.

The species is here placed under *Physopella*, because it accords in the characters of its uredinia and telia with the type species of that genus, while it does not thus accord with *Phakopsora* or

Schroeteriaster. The type species of *Phakopsora* possesses a membranous peridium with paraphyses intermixed with the spores of the uredinium, while the type of *Schroeteriaster* is without peridium or paraphyses, and with colored spores, having evident pores. All three genera show lenticular telia in their types.

The writer does not wish to express an opinion as to the correct limitations of the genus *Physopella*, or even of its validity, but thinks it best to assort species into genera representing like groups, so far as that is possible. Too few species are yet known with both uredinia and telia, and too great obscurity yet exists regarding the life cycle of these forms to make a fully rational and workable assortment of the various forms possible.

6. ***Physopella concors*** (Arth.) comb. nov.

Uredo concors Arth. Mycol. 7: 330. 1915.

ON FABACEAE:

Dolichos Lablab L., El Yunque, April 14, II, 197.

The general characters of this rust so closely resemble those of *P. Meibomia*, that since becoming acquainted with that species there seems not to be the slightest chance for error in transferring the rust from the form-genus *Uredo* to the genus *Physopella*. Both macroscopically and microscopically the two forms are, however, thoroughly distinct specifically. The telia of *P. concors*, which have not yet been found, are likely to occur, as in *P. Meibomia*, among well-matured uredinia, but a diligent search of the material in hand did not reveal them.

Olivea gen. nov.

Cycle of development includes pycnia, aecia, uredinia, and telia; autoecious. Aecia subepidermal, other sori subcuticular.

Pycnia mammilliform, without estiolar filaments.

Aecia deep-seated, protected by the host tissues. Peridium apparently wanting. Aeciospores catenulate with intercalary cells, obovate, strongly echinulate-verrucose, with rod-like warts, the walls colored; in appearance simulating urediniospores.

Uredinia from a minute, subcuticular hymenium, expanding into a globose mass of strongly incurved paraphyses, having their bases united. Urediniospores borne singly on pedicels, obovate, stellately angular, echinulate, the wall colored, with pores approximately equatorial, at the angles.

Telia replacing the uredinia in the basket of paraphyses, numerous, free, 1-celled, sessile, colorless, cylindraceous, the wall thin, smooth.

Type species *Uredo capituliformis* P. Henn. (on *Alchornea* sp., Brazil, *Ule* 3060, supplemented by aecia on *A. latifolia* Sw., Porto Rico, *Stevens* 5437, and by telia on *A. latifolia* Sw., Porto Rico, *Whetzel & Olive* 345).

7. ***Olivea capituliformis*** (P. Henn.) comb. nov.

Uredo capituliformis P. Henn. Hedw. **34**: 97. 1895.

Ravenelia capituliformis P. Henn. Hedw. **43**: 160. 1904.

ON EUPHORBIACEAE:

Alchornea latifolia Sw., El Yunque, March 12, O, I, II, III, 345; Naguabo on slope of El Duque, April 19, O, I, 346.

Pycnia epiphyllous, in small groups, mammilliform, honey-yellow, subcuticular but depressing or absorbing the epidermal cells, 80–165 μ across by 50–95 μ high; ostiolar filaments wanting.

Aecia amphigenous, more abundant above, gregarious on slightly discolored spots 2–5 mm. across, pustular, brown, deep-seated among the palisade cells of the host, ostiolate; peridium none; aeciospores obovate, stellately protuberant with one apical and four lateral swellings, 20–24 by 27–35 μ ; wall cinnamon-brown, 1–2 μ thick, closely and strongly echinulate-verrucose with colorless rod-like warts, 2–3 μ long.

Uredinia chiefly hypophyllous, often opposite the aecia, gregarious, forming globose, chestnut-brown balls, 0.1–0.3 mm. across, seated lightly on the leaf surface; paraphyses cylindrical, incurved, strong, united at the bases, forming a globose basket, 9–11 by 75–100 μ , the wall dark chestnut-brown, thickened nearly or quite to close the lumen; urediniospores simulating the aeciospores, obovate, stellately protuberant with one apical and four lateral swellings, 23–29 by 28–33 μ ; wall cinnamon-brown, 1–1.5 μ thick, closely and finely echinulate, the pores obscure.

Telia replacing the uredinia in the same sorus; teliospores cylindric or cylindric-clavate, 12–16 by 45–60 μ , rounded above, wall uniformly thin, 1 μ or less, smooth, colorless.

In the notes appended to the original description of the uredinia of this rust, Hennings (Hedw. **34**: 97) speaks of it as “a very wonderful species,” and nine years later, again having occasion to record its occurrence in Brazil, calls it “a very remarkable

species, having an extraordinary resemblance to Perisporiaceae, like *Perodiella*." The uredinia are indeed most unusual, both in the form of the spore, and in the ball or basket of paraphyses, which hold together firmly at their bases and easily separate as a whole from the host. The aecia are no less strange in being so deep-seated, and in having spores so closely resembling the urediniospores, even to the sculpturing. The aeciospores come nearest to being echinulate of any known. The teliospores germinate upon maturity.

It is a pleasure to dedicate this genus to Dr. E. W. Olive, of the Brooklyn Botanic Garden, who has done much to make known the nuclear behavior and historical development of the rusts, and whose recent paper in connection with Professor H. H. Whetzel on the short-cycle, aecia-like rusts of Porto Rico, a product of their recent exploration of the island, has been an especially notable achievement.

The collections at present known to the writer, beside the above by Whetzel and Olive are three recorded in the Stevens Porto Rican list (Mycol. 7: 328-329), two of them from Porto Rico with O, I, II, and one from Tortola with O, I, and two by E. Ule from Brazil, as recorded by Hennings, l. c.

8. *Olivea Petitiæ* sp. nov.

ON VERBENACEAE:

Petitia domingensis Jacq., Maricao, mountains along the Rio Grande river, March 23, II, iii, 349.

Uredinia hypophyllous, somewhat grouped on indefinite, brownish spots, or scattered, forming globose, chestnut-brown balls, 0.1-0.3 mm. across, seemingly superficial; paraphyses cylindrical, incurved, joined by their bases, forming a globose basket holding the spores, 8-10 by 90-175 μ , the wall dark cinnamon-brown, thick, nearly or quite closing the lumen; urediniospores globoid-obovate, somewhat stellately angular, 24-32 by 29-32 μ ; wall cinnamon-brown, about 1.5 μ thick, moderately echinulate, the pores approximately equatorial, usually 4, one at each projecting angle.

Telia replacing the uredinia in the same sorus; teliospores clavate or fusiform-clavate, 13-19 by 45-58 μ ; rounded or narrowed above; wall uniformly thin, 1 μ or less, smooth, colorless.

The gross appearance of this species is like that of *Olivea*

capituliformis, and many of the microscopic details as well. The remarkable balls of paraphyses inclosing the urediniospores are similar, and the colorless teliospores also. As in the former species the surest way to find the teliospores is to crush a ball of paraphyses, taken from a well-matured group of sori. The teliospores are usually found germinated, which obscures their true shape.

9. KUEHNEOLA FICI (Cast.) Butler.

ON ARTOCARPACEAE:

Carica Papaya L. (*Ficus Carica* L.), Yauco, March 30, II, 322.

Ficus crassinervia Desf., El Yunque, April 12, II, 338.

Ficus laevigata Vahl, Barceloneta, April 8, II, 339.

Ficus lentiginosa Vahl, Mayagüez, March 3, II, 341;
Yauco, March 30, II, 340.

10. KUEHNEOLA GOSSYPHII (Lagerh.) Arth.

ON MALVACEAE:

Gossypium hirsutum L., Añasco, March 28, II, III; Yauco, March 30, II, 110; Barceloneta, Feb. 25—April 5, II, 109.

Gossypium sp., Rio Piedras, April 22, II, 112.

11. KUEHNEOLA MALVICOLA (Speg.) Arth.. N. Am. Flora 7: 187. 1912.

ON MALVACEAE:

Malache scabra B. Vogel (*Pavonia racemosa* L.), Martin Peña, April 10, II, 94.

This is the first record of the rust for the West Indies. The host is furthermore a new one for the species. Only uredinia were found, the spores measuring a trifle larger than usual, 18–23 by 23–32 μ . Sections of the sori showed a few peripheral paraphyses, not rising above the spore mass.

12. CEROTELIUM CANAVALIAE Arth.

ON FABACEAE:

Canavalia ensiformis DC., Barceloneta, Feb. 25, II, 380.

The Sydows have recently pointed out (Monog. Ured. 3: 524. 1915), that the telia of this species closely resemble those of the

type species of the genus *Dietelia*, and have consequently transferred it to that genus, as *D. Canavaliae* (Arth.) Syd. The writer, however, holds that this rust, being a long cycle form, should not be placed in a short cycle genus, like *Dietelia*, even if the telia be similar.

13. SCHROETERIASTER FENESTRALA Arth.

ON EUPHORBIACEAE:

Phyllanthus distichus (L.) Muell.-Arg. (*Cicca disticha* L.), Mayagüez, March 13, II, 323; Guanica, March 30, II, 324.

Phyllanthus Niruri L., Rio Piedras, April 22, II, 238.

The last host is new for the rust. Although these three collections show uredinia only, yet in so far they confirm the view at first expressed (MYCOL. 7: 332. 1915), that the form on *P. distichus* is the same rust as the one on *P. grandiflorus*, although the urediniospores range a trifle smaller, with paler walls. The form on *P. Niruri* is like that on *P. distichus* in the character of the urediniospores, with possibly still paler spore-walls. Sections from *P. Niruri* gave good details for the peridium, and confirmed the original description.

Family: **Aecidiaceae (Pucciniaceae)**

14. RAVENELIA INDIGOFERAE Tranz.

ON FABACEAE:

Indigofera suffruticosa Mill. (*I. Anil* L.), Mayagüez, March 2-20, II, 190; Añasco, March 28, II, 192; Yauco, March 30, II, 191; Barceloneta, April 5, II, 193; Naguabo, April 19, II, 194.

15. RAVENELIA INGAE (P. Henn.) Arth.

ON MIMOSACEAE:

Inga laurina Willd., Maricao, March 24, O, II, 210; El Yunque, April 14, O, II, 209.

The host is a new one for the species.

16. **Ravenelia Whetzelii** sp. nov.

ON MIMOSACEAE:

Inga vera Willd., Maricao, south, March 23, O, II, 207,

along the Rio Grande, March 24, O, II, 208, west along highway, March 25, O, II, 205; Mayagüez, "La Jagua," March 28, O, II, 206 (type).

Pycnia amphigenous, numerous, in crowded orbicular groups 1-3 mm. across, punctiform, dark-brown, subcuticular, depressed-hemispherical.

Uredinia amphigenous, causing more or less hypertrophy, at first surrounding the pycnia, forming groups or rings 1-6 mm. across, small, crowded and confluent, tardily naked, dark cinnamon-brown, subepidermal, pulverulent, ruptured epidermis conspicuous; paraphyses none; urediniospores narrowly obovate, 18-24 by 30-40 μ ; wall golden-brown, moderately thick 1.5-3 μ , thicker above, 3-7 μ , echinulate-verrucose and longitudinally striate, the continuous or beaded striations about 1 μ apart, the pores 3 or 4, equatorial.

Telia unknown.

The species differs from *R. Ingae* by the darker and much larger urediniospores with their prominent striations. A re-examination of collections previously known, shows some tendency for a part of the spores on *Inga Inicuil* from Mexico, the type of *Uredo excipulata* Syd., to be moderately striate, but in all other cases the characters are uniform as given for *R. Ingae*. There is, however, a collection from Quito, Ecuador, on *Inga pachycarpa*, January, 1892, *G. Lagerheim*, distributed by Prof. Lagerheim under the tentative name, *Uromyces Ingae* ined., which agrees in every particular with the present species, the spores being large, dark and strongly striate. It may be noted as curious that the previous collections from four localities on the island, all on *I. vera*, belong to the preceding species, while the four collections by Whetzel and Olive from other but not distant localities, also on *I. vera*, belong to the new species.

17. RAVENELIA STEVENSII Arth.

ON MIMOSACEAE:

Acacia riparia H. B. K., Coamo, April 24, II, 181.

18. RAVENELIA SILIQUAE Long, Bot. Gaz. 35: 118. 1903.

ON MIMOSACEAE:

Vachellia Farnesiana (L.) W. & A. (*Acacia Farnesiana* Willd.), Yauco, March 31, II, 195; Coamo, April 24, II, 196.

The first record of a station outside of Mexico. The collections show the characteristic large uredinial sori on the pods, with no other stages.

19. RAVENELIA CAESALPINIAE Arth. (*Uromyces Caesalpiniae* Arth.).

ON MIMOSACEAE:

Mimosa ceratonia L., Mayagüez, March 7, O, II, III, 183;
Maricao, March 23, ii, III, 184; Barceloneta, April 6,
O, II, iii, 185; Rio Piedras, April 11, O, II, III, 187;
Naguabo, April 19, II, 186.

This rust, first known and named from the uredinial stage, proved a great surprise when the telia were found among the 1915 collections of the Stevens set. The teliospores, instead of being the compound, capitate structures, with cystoid appendages, commonly seen among species of *Ravenelia*, were single, obovate and pedicellate spores, in no wise differing from those usually placed under *Uromyces*. The second surprise came in examining the Whetzel-Olive collections. These gave ample telial material, which not only showed what had been seen before, but also many compound spores. Such compound spores are in reality primitive teliospore heads, containing 2-8 cells each, those with three cells being most common. The pedicels are adherent the same as the cells. Both cells and pedicels are not merely appressed, but are grown fast together, so that they are made angular, and the cells are squarish above. No indication of cysts can be detected. The free, *Uromyces*-like spores were intermixed with the compound ones. The teliospores germinate readily upon maturity. The telial structure, as well as other characters, now justifies replacing the species under the genus *Ravenelia*. The specific name proves to be an unfortunate one, as it gives an erroneous impression regarding the affinities of the host.

20. PROSPIDIUM APPENDICULATUM (Wint.) Arth. (*Puccinia appendiculata* Wint.).

ON BIGNONIACEAE:

Stenolobium Stans (L.) D. Don (*Tecoma Stans* Juss.),
Santurce, April 19, II, III, 374.

21. PROSPIDIUM PLAGIOPUS (Mont.) Arth. N. Am. Flora 7: 16,
1912.

ON BIGNONIACEAE:

Tecoma pentaphylla (L.) Juss., Añasco, March 28, II, 358; Rio Piedras, April 11, II, 373.

This is the first time the rust has been found outside of a limited area in Cuba. The host is also a new one for the species. The urediniospores vary somewhat from the Cuban form in having longer and more noticeable echinulation, and in the slight development of the hygroscopic layer.

22. ARGOMYCES VERNONIAE Arth.

ON CARDUACEAE:

Vernonia borinquensis Urban, Maricao, March 15, ii, III, 149, March 16, ii, III, 150.

Vernonia sericea L. C. Rich (*V. phyllostachya* Gleason), Barceloneta, April 8, II, 157.

23. UROMYCES ERAGROSTIDIS Tracy.

ON POACEAE:

Eragrostis tephrosanthes Schult., San German, April 1, II, 446.

24. UROMYCES LEPTODERMUS Syd.

ON POACEAE:

Lasiacis ligulata Hitch. & Chase, Maricao, March 23, II, 420.

Lasiacis Swartziana Hitch., Mayagüez, March 7, II, 395; Maricao, March 16, II, 426.

Panicum parvifolium Lam., Martin Peña, April 10, II, 434.

25. UROMYCES IGNOBILIS (Syd.) Arth.

ON POACEAE:

Sporobolus indicus (L.) R. Br., Mayagüez, March 3, II, 423, March 8, II, 422, March 13, II, 421; Naguabo, April 19, II, 443.

26. UROMYCES RHYNCOSPORAE Ellis.

ON CYPERACEAE:

Rhynchospora distans (Michx.) Vahl., Martin Peña, April 10, ii, III, 29.

Rhynchospora setacea (Berg.) Boeck., Martin Peña, April 10, ii, III, 34.

In the report on the Stevens collections (MYCOL. 7: 182) the collection made at Mayagüez, P. R. by Clinton, on *R. aurea*, as well as the one from the Bahamas on *R. cyperoides*, both showing only uredinia, should be transferred to *Puccinia angustatoides*. Not until the collections by Whetzel and Olive came to hand was it possible to separate the two forms. It is found that the *Uromyces* form has somewhat smaller, thinner-walled urediniospores, with greater uniformity in size, than those of the *Puccinia* form.

27. *UROMYCES SCLERIAE* P. Henn.

ON CYPERACEAE:

Scleria canescens Roschl, El Yunque, April 12, II, 384.

Scleria pterota Presl, Mayagüez, March 9–April 3, II, III, 386a; Añasco, March 28, II, 387; Rio Piedras, April 11, II, III, 385; Naguabo on slope of El Duque, April 19, II, III, 382a.

The first mentioned host is new for the species. The rust sometimes occurs intermixed on the same plants with *Puccinia Scleriae*.

28. *UROMYCES APPENDICULATUS* (Pers.) Fries.

ON FABACEAE:

Phaseolus adenanthus G. Meyer, Mayagüez, March 1, II, 189; Barceloneta, April 5, II, 376.

Phaseolus lathyroides L., Maricao, March 25, II, 203.

Phaseolus vulgaris L., Maricao, March 25, II, 202.

Vigna repens (L.) Kuntze, Mayagüez road to Guanajibos, March 3, II, 201.

The second host named is a new one for the species.

29. *UROMYCES DOLICHOLOI* Arth.

ON FABACEAE:

Caján Caján (L.) Millsp. (*Cajanus Caján* Pollard, *C. indicus* Spreng.), Mayagüez, Feb. 28, II, 211; Yauco, March 30, II, 212.

Dolicholus eninimus (L.) Medic., Guanica, March 30, II, 204.

Dolicholus reticulatus (Sw.) Millsp., Mayagüez, March 7, II, 188.

The second host named is new for the species.

30. *UROMYCES HEDYSARI-PANICULATI* (Schw.) Farl. (*Uredo Desmodii-tortuosi* P. Henn.).

ON FABACEAE:

Meibomia Scorpiurus (Sw.) Kuntze (*Desmodium Scorpiurus* Desv.), Mayagüez, March 20, II, 218.

Meibonia tortuosa (Sw.) Kuntze (*Desmodium tortuosum* DC), Yauco, March 31, II, 220.

Through the kindness of Dr. Lindau of the Berlin Museum, the writer has recently been able to examine the spores from the original collection made by *Sintenis* at Fajardo in Porto Rico and established by P. Hennings as a new species under the name *Uredo Desmodii-tortuosi*. The examination of this material confirms the prediction in connection with the discussion of the Stevens material (MYCOL. 7: 189). The spores do not in any way differ from the urediniospores on other collections of the same or other hosts, they being finely verrucose, and not smooth as stated in the original description.

31. *Uromyces Sabineae* sp. nov.

ON FABACEAE:

Sabinea punicea Urban, Maricao, Rio Grande river, March 23, II, III, 182.

Uredinia hypophyllous, scattered, or somewhat gregarious on slightly reddish, effused spots, applanate, round, 0.1–0.2 mm. across, soon naked, light cinnamon-brown, pulverulent, ruptured epidermis evident; urediniospores globoid or broadly obovoid, 18–20 by 19–26 μ ; wall light yellow, thin, about 1.5 μ , moderately echinulate, the pores fairly distinct, 3 or occasionally 4, equatorial.

Telia hypophyllous, scattered or somewhat gregarious, pulverinate, round, 0.1–0.3 mm. across, early naked, blackish-brown, ruptured epidermis evident; teliospores globoid, 20–24 by 22–29 μ ; wall dark chestnut-brown, moderately thick, 3 μ , thicker above, 4–7 μ , moderately verrucose; pedicel colorless, one half to once length of spore.

The collection shows about an equal abundance of well-formed uredinia and telia.

32. *UROMYCES NEUROCARPI* Dietel.

ON FABACEAE:

Clitoria rubiginosa Juss., Mayagüez, March 20, II, 216,

March 27, II, 217, April 4, II, III, 381; Barceloneta, April 6, II, 215; Martin Peña, April 10, II, 214.

33. *UROMYCES PROËMINENS* (DC.) Pass.

ON EUPHORBIACEAE:

Chamaesyce brasiliensis (Lam.) Small (*Euphorbia brasiliensis* Lam.), Mayagüez, March 7, I, 243.

Chamaesyce hirta (L.) Millsp. (*Euphorbia hirta* L., *E. pilulifera* L.), Mayagüez, March 3, II, 247, March 4, II, 244; Boqueron, March 11, I, II, 246; Yauco, March 31, II, 248; San German, April 1, II, 245.

The first host is new for the West Indian islands. The rust has also been collected at Rio Piedras, on *C. prostrata* (Ait.) Small (*Euphorbia prostrata* Ait.), March 26, 1916, by J. A. Stevenson 5061, another new host for the island.

34. *UROMYCES HOWEI* Peck.

ON ASCLEPIADACEAE:

Asclepias curassavica L., Maricao, March 22, II, 297; Coamo, April 24, II, 294.

35. *UROMYCES CESTRI* Mont.

ON SOLANACEAE:

Cestrum laurifolium L'Her., Fajardo, April 20, I, III, 369; Campo Allegra, April 21, I, III, 370.

Cestrum macrophyllum Vent., Maricao, March 16-23, I, III, 365; Barceloneta, April 6, I, 366; Tanamá River Valley, April 7, I, 367; El Yunque, April 14, I, III, 368.

36. *UROMYCES HELLERIANUS* Arth.

ON CUCURBITACEAE:

Cayaponia racemosa (Sw.) Cogn., Mayagüez, March 8, II, III, 255; Barceloneta, April 6, II, III, 256; El Yunque, April 14, II, iii, 254; El Duque near Naguabo, April 19, II, iii, 253; Rio Piedras, April 22, II, 257.

Melothria guadalupensis (Spreng.) Cogn., Mayagüez, March 6, II, iii, 252, March 29, II, 251; El Duque near Naguabo, April 19, II, 249; Rio Piedras, April 22, II, 250.

37. *Uromyces columbianus* Mayor.

ON CARDUACEAE:

Melanthera canescens (Kuntze) O. E. Schultz, Mayagüez, March 13, II, 162, March 20, II, 163; Añasco, March 28, II, 164; Maricao, March 25, II, 165; Yauco, March 31, II, 167; Barceloneta, April 6, II, 166.

38. *Uromyces bidenticola* (P. Henn.) comb. nov. (*U. Bidentis* Sydow, not Lagerh.).

Uredo bidenticola P. Henn. Hedwigia 37: 279. 1898.

ON CARDUACEAE:

Bidens leucantha Willd., Yauco, March 3, II, 136; Hormigueros, March 11, II, 135; Barceloneta, April 5, II, 137.
Bidens pilosa L., Boqueron, March 11, II, 141; Maricao, March 22, II, 140; San German, April 1, II, iii, 138; Tanamá River Valley, April 7, II, 142.

39. *Uromyces bidentis* Lagerh. (*U. densus* Arth.).

ON CARDUACEAE:

Bidens pilosa L., Maricao, in cemetery, March 25, 139.

A few sori of *Uromyces bidenticola* occur on the same leaves with the short cycle form, the latter being abundant and cinereous from germination. Neither the original description nor type material of Lagerheim's *Uromyces Bidentis* had been seen by the writer until recently. It is now found that Lagerheim begins his diagnosis (Bull. Soc. Myc. Fr. 11: 213) with the descriptive word "Leptouromyces," and that the specimens which he distributed from the type locality, judging from the one in the herbarium of the N. Y. Bot. Garden, fully establish the fact that his name applies to the short cycle species. This requires that the other, long cycle species be called *Uromyces bidenticola*, the type locality being Jamaica, on *Bidens leucantha*. The application of the short cycle name to the long cycle species was first made by the Sydows (Monog. Ured. 1: 3. 1909). It appears that the first clear recognition of the two forms was by Bubák as early as 1904, for he says in connection with a specimen of *Uredo Bidentis* from the Canary Islands, distributed in the Austrian Kryptogamae Exsiccatae no. 937, that "on the Höhnel's collection (Sydow, Ured. 1647) there also occurs *Uromyces*

Bidentis Lagerh., which is a *Lepturomyces* and is not connected genetically with the preceding *Uredo*-form." However, not all the specimens of Sydow, Ured. 1647 show the short cycle form, for the one at the N. Y. Bot. Garden does not.

40. *UROMYCES PIANHYENSIS* P. Henn.

ON CARDUACEAE:

Wedelia reticulata DC., Yauco, March 31, II, 159; Tanamá River Valley, April 7, II, 160.

41. *PUCCINIA PURPUREA* Cooke.

ON POACEAE:

Holcus sudanensis (Piper) Hitchc., Mayagüez, March 4, II, III, 405.

A new host for the species.

42. *PUCCINIA CYNODONTIS* DeLac.

ON POACEAE:

Capriola dactylon (L.) Kuntze (*Cynodon dactylon* Pers.), Mayagüez, Feb. 29, II, 424; Naguabo, April 20, II, 441.

43. *PUCCINIA CENCHRI* Diet. & Holw.

ON POACEAE:

Cenchrus echinatus L., Mayagüez, March 3, II, III, 406; Boqueron, March 11, II, 407; Yauco, March 31, II, III, 409; San Germán, April 1, II, 408; Barceloneta, April 6, II, 435; Tanamá River Valley, April 7, II, 432.

44. *PUCCINIA HUBERI* P. Henn. (*P. Puttemansii* P. Henn. Hedw. 41: 105. 1902).

ON POACEAE:

Panicum fasciculatum Sw., Barceloneta, April 6, II, III, 445.

Panicum trichoides Sw., Mayagüez, March 6, II, III, 414, March 10, II, III, 415, March 20, II, III, 416; Tanamá River Valley, April 7, II, III, 433.

In the study of the present material a more extended comparison with South American forms was made than had before been feasible. Some time ago the authorities of the Berlin Museum were so kind as to send me among other things a part of the original collections for *Puccinia Huberi* and *P. Puttemansii*,

and it is now found that the two are identical. The latter form was obtained on an undetermined species of *Panicum* in Brazil. Both forms show uredinia and telia, and if any difference can be seen in them, it is a somewhat greater regularity in the form of the teliospores for *P. Puttemansii*, a variation well known in a number of grass rusts.

45. PUCCINIA LEVIS (Sacc. & Bizz.) Magn.

ON POACEAE:

Paspalum fimbriatum H. B. K., Yauco, March 30, II, 418.

Paspalum millegrana Poir., Campo Allegra, April 21, II, 439.

The species is now reported for the first time on *Paspalum millegrana*.

46. PUCCINIA SUBSTRIATA Ellis & Barth.

ON POACEAE:

Chaetochloa geniculata (Lam.) Millsp. & Chase (*C. imberbis* Scribn.), Rio Piedras, April 22, II, III, 438.

Eriochloa subglabra (Nash) Hitchc., Mayagüez, Feb. 29, II, 401, March 1, II, 400, March 3, II, 403, March 9, II, 402, March 13, II, 398, 399; Rio Piedras, March 11-17, II, 404.

Ichnanthus pallens (Sw.) Munro (*Panicum pallens* Sw.), Mayagüez, March 2, II, 396; El Yunque, April 12, II, III, 397.

Paspalum paniculatum L., Mayagüez, March 13, II, 392; Maricao, March 15, II, III, 391; San German, April 1, II, 393; Naguabo, April 19, II, 411; Rio Piedras, April 23, ii, 390.

Syntherisma digitata (Schwartz) Hitchc., Barceloneta, April 6, II, 431; Naguabo, on slopes of El Duque, April 19, II, III, 444.

Valota insularis (L.) Chase, Boqueron, March 11, II, 394; San German, April 1, ii, 447; Campo Allegra, April 21, II, 436.

All the above hosts, except *Paspalum paniculatum*, are new for the island, and with the exception of *Chaetochloa geniculata* are now first given for the species. Field evidences were obtained to

show that possibly this rust is connected with *Aecidium tubulosum* on *Solanum*.

47. PUCCINIA CANALICULATA (Schw.) Lagerh.

ON CYPERACEAE:

Cyperus ferax L. C. Rich., Naguabo, cane field along railroad, April 19, II, 13; Naguabo, slopes of El Duque, April 19, II, 14.

Cyperus giganteus Vahl, Mayagüez, March 13, II, 19.

Cyperus laevigatus L., Mayagüez, March 3, II, 18.

Cyperus odoratus L., Martin Peña, April 10, II, 20; Naguabo, April 19, II, 21.

Cyperus radiatus Rottb., Naguabo, April 19, II, 33.

Cyperus reticulatus L., Naguabo, April 19, II, III, 22.

Cyperus sphacelatus Rottb., Mayagüez, March 6, II, 16; Cataño, April 20, II, 15; Campo Allegra, April 21, II, 17.

Cyperus surinamensis Rottb., Naguabo, April 19, II, 11, 12.

Kyllinga brevifolia Rottb., Martin Peña, April 10, II, 55.

Kyllinga pumila Michx., Añasco, March 28, II, 54; Rio Piedras, April 11, II, 52; El Yunque, April 12, II, 53.

In the one collection showing teliospores, which is on a host new for the rust, the sori have an appearance quite unlike the usual form. They are scattered singly, instead of being in considerable, compact areas, and have a different color. The teliospores have a considerably thinner apex, being only $3-7\mu$ thick. The form agrees well with the description of the Corsican species *P. Romagnoliana* Maire & Sacc., but the telia of that species are said to be surrounded by a heavy stroma. This could not be matched in the Porto Rican material as no sori having teliospores only were seen, the sori apparently being uredinial in which teliospores were developing, and not strictly telial.

48. PUCCINIA ANGUSTATOIDES Stone, Bull. Torrey Club 36: 549. 1909.

ON CYPERACEAE:

Rynchospora corymbosa (L.) Britton, Mayagüez, March 13, II, 30.

Rhynchospora cyperoides (Sw.) Mart., El Yunque, April 12, II, 31; Cataño, April 20, II, iii, 32.

This is the first recognition of the rust in the West Indies. It also occurs as uredinia on *R. aurea* Vahl from Mayagüez, P. R., as well as on *R. cyperoides* from the Bahamas, both mentioned in the Stevens' Porto Rican list (MYCOL. 7: 182), and in the N. Am. Flora (7: 232, 233), under *Uromyces Rhynchosporae*. The two forms are undoubtedly correlated, but the form with two-celled teliospores appears to have somewhat larger and thicker-walled urediniospores, which also show more variability in size.

The species has heretofore been known from a few localities in Alabama, Louisiana and Texas, on *R. corniculata*. The teliospores on *R. cyperoides* appear to be somewhat longer and less thickened at apex than those on *R. corniculata*. The other hosts show only uredinia.

49. **Puccinia Scleriae** (Paz.) comb. nov.

Rostrupia Scleriae Paz., Hedw. 31: 96. 1892.

ON CYPERACEAE:

Scleria cubensis Boeckl, Maricao on Rio Grande river, March 24, II, 389.

Scleria pterota Presl, Mayagüez, March 9–April 3, II, III, 386; Maricao, March 23, II, III, 388; El Yunque, April 12, II, 383; Naguabo on slope of El Duque, April 19, II, III, 382.

Soon after arriving in Porto Rico Messrs. Whetzel and Olive sent to Lafayette, Indiana, the rusted parts as well as living plants of "a herbaceous vine, possibly *Passiflora*, and a sedge," representing a "possible combination." They wrote that "the two always occur together," being "very abundant," in the vicinity of Mayagüez. This initial lot of material was followed by ample collections of the two forms of rust, and of corroborative observations. The hosts were later determined as *Passiflora rubra* and *Scleria pterota*. Repeated attempts to germinate either the aeciospores or teliospores utterly failed, so that no cultures were secured, but the writer is inclined to think that a good clue has been secured, and that the two forms will eventually be found to be alternate stages of the same species.

The rust on the *Scleria* proved more than usually interesting on account of the irregularity in septation of the teliospores. They were found to have from one to four cells each, more commonly three cells and, every sorus, whatever the dominant form of spore, showed at least a few spores with three cells. It was not difficult to identify this rust with the Brazilian form on *Scleria hirtella*, named by Pazschke *Rostrupia Scleriae*. To the writer a variable number of cells in the teliospore, without other diagnostic characters, does not constitute a generic distinction, and the species is therefore transferred to *Puccinia*.

The species differs from *Puccinia scleriicola* not only in the variable number of teliosporic cells, but in the more cylindric form of the teliospores with thinner side-walls, and in the marked development of a dark stroma about the sorus. The urediniospores are similar in the two species, but in *P. Scleriae* they have somewhat thinner walls, and still more obscure pores.

Puccinia Scleriae is at present only known from Brazil and Porto Rico, while *Aecidium passifloriicola*, the supposed alternate form, is known from Porto Rico, Jamaica and Peru.

50. PUCCINIA ELEOCHARIDIS Arth.

ON CYPERACEAE:

Eleocharis capitata (L.) R. Br., Mayagüez, March 3, II, 37; Martin Peña, April 10, II, 36.

Eleocharis geniculata (L.) R. Br., Mayagüez, March 2, II, 39, March 13, II, 38; Naguabo, April 19, II, 40.

Eleocharis interstincta (Vahl) R. & S., Mayagüez, March 20, II, 35.

Eleocharis mutata (L.) R. & S., Martin Peña, April 10, II, 41, 42.

The last named host is a new one for the rust. No teliospores were found in any of the collections.

51. PUCCINIA CLADII Ellis & Tracy.

ON CYPERACEAE:

Mariscus jamaicensis (Crantz) Britton (*Cladium effusum* Torr.), Martin Peña, April 10, II, 43.

The first record of this rust for Porto Rico. It has previously been reported for Bermuda on the same host, and it also occurs on the same host in North Carolina and Mississippi.

52. PUCCINIA FIMBRISTYLIDIS Arth.

ON CYPERACEAE:

Fimbristylis diphylla (Retz) Vahl, Barceloneta, April 6, II, III, 26; Campo Allegra, April 21, II, III, 25.

The type collection for this species was on *Fimbristylis polymorpha* from Mexico. The present collections agree in both uredinia and telia with the type material. Stevens made five collections of the rust on *F. diphylla*, four in Porto Rico at Ponce, Nov. 8, 1913, 4381, Bandero, July 15, 1915, 8565, Alto, July 16, 1915, 8603, 8707, and one in Martinique 2970, all showing only uredinia. A collection made by Clinton at Mayagüez, in 1904, on *Fimbristylis* sp., is identical, and the host is certainly *F. diphylla*. Collections on *F. ferruginea* previously referred to this species are now believed to belong to *Uredo superior* Arth.

53. PUCCINIA SMILACIS Schw. Nat. Ges. Leipzig 1: 72. 1822.

ON SMILACEAE:

Smilax domingensis Willd., Maricao, March 16, II, 348.

The first record of this rust for the West Indies.

54. PUCCINIA CANNAE (Wint.) P. Henn.

ON CANNACEAE:

Canna coccinea Ait., Maricao, March 16, II, 377.

Canna sp. (cultivated), Barceloneta, Feb. 25, II, iii, 225, April 7, II, iii, 378; Mayagüez, March 2, II, 224, March 6, II, 222, March 9, II, 223.

Thalia geniculata L., Mayagüez, March 1, II, 227, March 13-20, II, 226.

55. PUCCINIA POLYGONI-AMPHIBII Pers. Syn. Fung. 227. 1801.

ON POLYGONACEAE:

Persicaria punctata (Ell.) Small (*Polygonum punctatum* Ell.), Mayagüez, March 1, II, 261, April 3, II, 262; Coamo, April 24, II, 260.

The first record for the West Indies. As usual for the rust in warm regions, and especially on this host everywhere, only uredinia occur.

56. PUCCINIA RIVINAE (Berk. & Curt.) Speg.

ON PETIVERIACEAE (PHYTOLACCACEAE):

Rivina humilis L., Yauco, March 30, I, 356, I, II, III, 357.

Trichostigma octandrum (L.) Walt. (*Rivina octandra* L.)

Yauco, March 30, I, II, III, 354; Coamo, April 24, I, 355.

The first record on *T. octandrum* for Porto Rico, this being the host on which the type was collected by Charles Wright in Cuba.

57. PUCCINIA ZORNIAE (Diet.) McAlpine, Rusts Austr. 172. 1906.

Uredo Zorniae Diet. Hedw. 38: 257. 1899.

ON FABACEAE:

Zornia diphylla (L.) Pers., Mayagüez, March 7, II, 200; Barceloneta, April 6, II, 199.

This species is now first reported from the West Indies. It has been known heretofore on the same host from Brazil, and on other hosts from the southern United States near the Gulf of Mexico, and from southern Africa and Australia. Only in Australia have teliospores been found.

The presence of paraphyses in the uredinia has not been heretofore recorded. They can only be seen well by use of sections. They are peripheral, scarcely rise above the spore mass, are delicate, clavate, 9–12 by 30 μ , with thin, colorless walls.

58. **Puccinia Ormosiae** sp. nov.

ON FABACEAE:

Ormosia Krugii Urban, El Yunque, April 14, II, iii, 276 (type); Naguabo on slope of El Duque, April 19, II, iii, 277.

Uredinia hypophyllous, scattered or somewhat grouped, round, 0.1–0.5 mm. in diameter, subepidermal, early naked, ruptured epidermis inconspicuous; paraphyses encircling the sorus, prominent, appearing under a hand lens like a whitish fringe, branched from near the base, expanding above into a large, irregular, botryoid head, nearly colorless, becoming fugacious when old; urediniospores irregularly obovoid, 20–26 by 24–32 μ ; wall chestnut-brown, about 1–1.5 μ thick, sparingly echinulate with prominent, slender points, only one pore, basal, rather obscure.

Teliospores arising from the uredinial sori, ellipsoid, 23–25 by 29–34 μ , rounded at both ends, moderately constricted at septum; wall chestnut-brown, uniformly 1.5 μ thick exclusive of the closely-set, large, bead-like warts, 2.5–3.5 μ in diameter; pedicel fragile, the spore readily breaking away close to the hilum.

A very striking species in all its characters. The remarkable paraphyses and the unusual appearance of the teliospores quickly arrest attention. No trace of pycnia could be detected.

59. *PUCCINIA INFLATA* Arth.

ON MALPIGHIACEAE:

Stigmaphyllon lingulatum (Poir.) Small, Boqueron, March 11, O, II, III, 327; Guanica, March 30, II, iii, 328; Yauco, March 31, II, III, 329; Fajardo hills, April 20, II, III, 331; Coamo, April 24, II, III, 330; Santurce, April 24, II, III, 332.

60. *PUCCINIA ARECHAVELATAE* Speg.

ON SAPINDACEAE:

Cardiospermum microcarpum H. B. K., Mayagüez, two kilometers east on Maricao road, March 7, 230, along river, March 19, 228; Fajardo, April 18, 229.

In the former Porto Rican list (MYCOL. 7: 236) the specific name of the host was erroneously printed "microspermum." The rust is a short cycle form.

61. *PUCCINIA GOUANIAE* Holw.

ON FRANGULACEAE (RHAMNACEAE):

Gouania lupuloides (L.) Urban, Mayagüez, Feb. 29, March 1, 6, 8, II₁, II₂, iii, 363.²

Gouania polygama (Jacq.) Urban, Mayagüez, March 10, II₁, 361, March 19, II₁, II₂, 362; Añasco, March 28, II₁, 360; San German, April 1, II₁, II₂, 359.

The Whetzel-Olive collections give the first opportunity to complete the life-cycle of this rust. All the collections on both hosts gave an abundance of primary uredinia, accompanied by pycnia. This stage is readily recognized, as the sori are seated on waxy, gall-like, hypophyllous thickenings or pockets of the leaf, one to four millimeters across. The pycnia are amphigenous, globoid or flask-shaped, sunken below the epidermis. The uredinia are oval to oblong, surrounding the pycnia, on the under side of the leaf, subepidermal, and without paraphyses.

² The primary uredinia, which function as aecia, and the secondary uredinia, which function as repeating spores, are indicated by subscripts.

They are early naked, applanate, pulverulent, and encircled by the ruptured epidermis. The secondary or true uredinia, are not on hypertrophied areas, but scattered over the under surface, without producing much discoloration. They arise beneath the epidermis, then project above it, possibly through a stoma, and expand superficially, being attached by a slender stalk, and may be removed readily as a whole. There is an abundant development of peripheral paraphyses, holding together at their bases, and usually one-septate. The spores in the primary form are somewhat larger, and very much thicker-walled than in the secondary form. No telial sori have been seen, all the teliospores being produced in uredinia.

The characters of the rust, taken altogether, show it to belong to the genus *Bullaria*, as projected in the North American Flora, and under that genus it becomes ***Bullaria Gouaniae*** (Holw.) comb. nov.

62. PUCCINIA HETEROSPORA Berk. & Curt. (*Uromyces Pavoniae* Arth.)

ON MALVACEAE:

Malache scabra B. Vogel (*Pavonia racemosa* L., *P. spicata* Cav.), Mayagüez, road to Guanajibo, March 3, 93.

Sida hederifolia Cav., Mayagüez, March 13, 95.

Sida humilis Cav., Yauco, March 30, 104.

Sida procumbens Sw., Guanica, March 30, 96.

Sida urens L., Mayagüez, March 4, 97, March 7, 98, March 20, 99; Barceloneta, March 6, 103; Boqueron, March 11, 100; Añasco, March 28, 101; Yauco, March 31, 102.

The second host is a new one for the species. The first host has been reported for the island before as the type collection for *Uromyces Pavoniae*. While Mr. Guy R. Bisby was recently studying the short cycle species of *Uromyces* represented in the Arthur herbarium he discovered the similarity of this form to the mesosporic condition of *Puccinia heterospora*, and upon searching was able to find a few two-celled teliospores in the type collection. The occurrence of two-celled teliospores is also vouched for by the Sydows (Monog. Ured. 2: 59. 1909). After recognizing the mesosporic character of the teliospores no reason could

be found for maintaining an independent species. Such a preponderance of mesospores is not uncommon with this rust on other hosts. We have here an instance in which all uredinologists agree that there is no taxonomic distinction between the genera *Uromyces* and *Puccinia* worth maintaining. Another collection on *Pavonia racemosa* was found in the cryptogamic herbarium of the N. Y. Bot. Garden, made near Port Angelo, Jamaica, May 12, 1903, *L. M. Underwood* 2992.

63. PUCCINIA PSIDII Wint.

ON MYRTACEAE:

Jambos Jambos (L.) Lyons (*Eugenia Jambos* L., *Jambosa Jambos* Millsp.) Maricao, March 15, II, 334, March 16, II, 335, March 23, II, 336.

64. PUCCINIA HYDROCOTYLES (Link) Cooke, *Grevillea* 9: 14. 1880.

ON AMMIACEAE (UMBELLIFERAE):

Hydrocotyle umbellata L., Mayagüez, south along railroad, March 20, II, 233, Experiment Station grounds, March 29, II, 232; Yauco, March 30, II, 234.

This is the first record of the rust for the West Indies, although common on the continents both to the north and south.

65. PUCCINIA CONCRESCENS Ellis & Ev.

ON ASCLEPIADACEAE:

Asclepias curassavica L., Maricao, March 16, electric light plant, 295, March 25, cemetery, 296.

Asclepias nivea L., Maricao, Rio Grande valley, March 24, 298.

The last host is a new one for the rust.

66. PUCCINIA OBLIQUA Berk. & Curt.

ON ASCLEPIADACEAE:

Metastelma lineare Bello, Maricao, March 22, 259.

Metastelma parviflorum R. Br., Mayagüez, March 7, 258.

67. PUCCINIA LITHOSPERMI Ellis & Kellerm. *Jour. Myc.* 1: 2. 1885.

ON CONVULVULACEAE:

Evolvulus nummularius L., Mayagüez, March 7, II, 379; Añasco, March 28, II, 311.

The first record of the species for the West Indies. The two collections show an abundance of uredinia, the spores of which measure slightly smaller than do the urediniospores on *Evolvulus pilosus* from the central United States. The difference is undoubtedly due to the influence of the host, *E. pilosus* being a strong, thick-leaved plant, while *E. nummularius* is a delicate thin-leaved plant with slender wiry stems. The species heretofore has been known only from Kansas to the Mexican border in the United States. The specific name of the rust was given under a misapprehension regarding the identity of the type collection.

68. PUCCINIA LANTANAE Farl.

ON VERBENACEAE:

Lantana involucrata L., Yauco, March 30, 325.

69. PUCCINIA URBANIANA P. Henn.

ON VERBENACEAE:

Valerianodes jamaicensis (L.) Medic., San Juan, Feb. 24, 269; Mayagüez, March 3, 267; Boqueron, March 11, 268; Añasco, March 28, 270; San German, April 1, 266; Barceloneta, April 6-8, 263; Fajardo and Naguabo, April 18-20, 264; Campo Allegra, April 21, 265.

Valerianodes strigosa (Vahl) Kuntze, Mayagüez, March 7, 272; Coamo, April 24, 271.

70. PUCCINIA LEONOTIDIS (P. Henn.) Arth.

ON LAMIACEAE (LABIATAE):

Leonotis nepetaefolia (L.) R. Br., Mayagüez, March 3, II, 123; Boqueron, March 11, II, 125; Yauco, March 30, II, 124; Barceloneta, April 8, II, 126.

71. PUCCINIA MEDELLINENSIS Mayor.

ON LAMIACEAE (LABIATAE):

Mesosphaerum atrorubens (Poir.) Kuntze (*Hyptis atrorubens* Poir.), Martin Peña, April 10, II, 117; Naguabo on slopes of El Duque, April 19, II, 116.

Mesosphaerum pectinata (L.) Poir. (*Hyptis pectinata* Poir.) Mayagüez, March 1, 6, 8, II, 119; Maricao, March 15, 16, 25, I, II, III, 120; Yauco, March 30, II, 121.

Mesosphaerum suaveolens (L.) Kuntze (*Hyptis suaveolens* Poir.), Añasco, March 28, II, 122.

72. PUCCINIA HYPTIDIS (Curt.) Tracy & Earle.

ON LAMIACEAE (LABIATAE):

Mesosphaerum capitatum (L.) Kuntze (*Hyptis capitata* Jacq.), Mayagüez, March 1, 8, II, 113; Maricao, March 16, II, 114; Rio Piedras, April 11, II, 115.

73. PUCCINIA INSTITITIA Arth.

ON LAMIACEAE (LABIATAE):

Mesosphaerum latanifolium (Poir.) Kuntze (*Hyptis latanifolia* Poir.), Maricao, March 15, II, 118.

74. PUCCINIA SALVIICOLA Diet. & Holw.

ON LAMIACEAE (LABIATAE):

Salvia occidentalis Sw., Maricao, March 3, II, 132; Mayagüez, March 7, II, 131, March 20, II, 130; Yauco, March 30, II, 133.

75. PUCCINIA FARINACEA Long.

ON LAMIACEAE (LABIATAE):

Salvia coccinea Juss., Mayagüez, March 3, II, 129; Maricao, March 24, II, 128.

76. **Puccinia cuticulosa** (Ellis & Ev.) comb. nov.

Uredo cuticulosa Ellis & Ev. Bull. Lab. Nat. Hist. Iowa 4: 67. 1896.

Uredo Adenocalymnatis P. Henn. Hedw. 35: 249. Oct. 1896.

Puccinia aequinoctialis Holw. Ann. Myc. 3: 22. 1905.

ON BIGNONIACEAE:

Cydista aequinoctialis (L.) Miers (*Bignonia aequinoctialis* L.), Martin Peña, near lagoon, April 10, ii, 372.

An imperfectly understood species. Only three collections have previously been known, each having received a different name, and each on a different although closely related host. The type came from Nicaragua, and like the Brazilian and Porto Rican collections has only uredinia. The Cuban collection of Holway besides uredinia shows a few teliospores. Possibly *Aecidium simplicior* Arth. may belong here.

77. PUCCINIA BLECHI Lagerh.

ON ACANTHACEAE:

Blechnum Brownei (Sw.) Juss., Mayagüez, March 3, 4, 9, II, 127.

78. *Puccinia fallaciosa* comb. nov. (*Uredo fallaciosa* Arth. Mycol. 7: 323. 1915).

ON RUBIACEAE:

Palicourea crocea (Sw.) R. & S., Mayagüez, March 6, 27, II, 352; Maricao, March 23, II, iii, 353.

Palicourea riparia Benth., El Yunque, April 12, II, 350.

Psychotria patens Sw., Maricao, March 21, II, 364.

The uredinia on these several collections are uniformly alike. The host genera are closely related, and the leaves of the several species have the same texture and general appearance. A number of rusts have been described on these hosts from South America, but none of them have been seen by the writer. *Uredo psychotriicola* P. Henn. from Brazil is similar, except the spores are said to be verrucose. *Uredo Palicoureae* P. Henn. from Peru appears to have much smaller spores, which is also the case for the urediniospores of *Puccinia Psychotriae* P. Henn. from Brazil, although the teliospores of this species agree fairly well. There is also a *Uromyces Psychotriae* P. Henn. from Brazil.

79. PUCCINIA LATERITIA Berk. & Curt.

ON RUBIACEAE:

Borreria levis (Lam.) Griseb., Mayagüez, March 1, 2, 13, 293.

Borreria verticillata (L.) G. F. W. Mey., Barceloneta, Feb. 25, 286, April 6, 289; Mayagüez, March 7, 290, March 13, 292; Maricao, March 7, 287, March 16, 291; San German, April 1, 288.

Diodia littoralis Sw., Boqueron, March 11, 285.

Diodia maritima Thonn., Mayagüez, March 3, 283; Santurce, April 24, 284.

Diodia rigida C. & S., Mayagüez, March 7, 282; Barceloneta, April 6, 281; Campo Allegra, April 21, 280.

80. PUCCINIA ROSEA (Diet. & Holw.) Arth.

ON CARDUACEAE:

Ageratum conyzoides L., Yauco, March 31, II, 158.

The host is new for the species.

81. PUCCINIA TAGETICOLA Diet. & Holw.

ON CARDUACEAE:

Tagetes erecta L., Maricao, March 25, II, 161.

The host, a native of Mexico, but cultivated in gardens under the name of African marigold, is a new one for the rust.

82. PUCCINIA SPEGAZZINI DeT.

ON CARDUACEAE:

Mikania scandens (L.) Willd., Mayagüez, March 13, 20, 168.

The rust is now first reported for Porto Rico, but previously collected in Martinique by Prof. F. L. Stevens. It is a common tropical species.

83. PUCCINIA SYNEDRELLAE P. Henn.

ON CARDUACEAE:

Emilia sonchifolia DC., Mayagüez, March 4-6, 143, March 7, 144, March 9, 145; Maricao, March 15, 146, March 25, 147; Añasco, March 28, 148.

Synedrella nodiflora (L.) Gaertn., Mayagüez, March 4-6, 152, March 13, 153; Yauco, March 31, 154; El Duque, April 19, 155.

84. ENDOPHYLLUM CIRCUMSCRIPTUM (Schw.) Whetzel & Olive
(*Aecidium circumscriptum* Schw.).

ON VITACEAE:

Cissus sicyoides L., Mayagüez, March 4, 6, 9, 75, March 20, 26, 76, March 29, 82; Maricao, March 16, 77; Yauco, March 31, 80; Tanamá River Valley, April 7, 81; Rio Piedras, April 21, 79; Coamo, April 24, 78.

In the Stevens list of Porto Rican rusts (MYCOL. 7: 316) the family of the host was incorrectly given as "Cucurbitaceae."

This species of *Endophyllum*, and the three which follow, have the general appearance of aecia, especially of the heteroecious forms belonging to grass and sedge rusts. The brilliant studies of Messrs. Whetzel and Olive, however, have fully demonstrated their telial character.

85. ENDOPHYLLUM STACHYTARPHETAE (P. Henn.) Whetzel & Olive.

ON VERBENACEAE:

Valerianodes cayennensis (Vahl) Kuntze, Rio Piedras, April 11, 22, 72.

The rust was first collected by J. R. Johnston at Rio Piedras, P. R., Feb. 2, 1913, but not determined. It is also known from St. Domingo, and occurs in South America on the same host from Colombia and Bolivia, and on *V. dichotoma* from Brazil. The last collection was made by E. Ule, no. 2163, and is the type for the species.

86. ENDOPHYLLUM DECOLORATUM (Schw.) Whetzel & Olive (*Aecidium decoloratum* Schw.).

ON CARDUACEAE:

Clibadium erosum (Sw.) DC., El Yunque, April 15, 71.

87. ENDOPHYLLUM WEDELIAE (Earle) Whetzel & Olive (*Aecidium Wedeliae* Earle).

ON CARDUACEAE:

Wedelia trilobata (L.) Hitchc., Mayagüez, Feb. 29, 65; March 3, 70, March 29, 66; Barceloneta, April 6, 68; Utuado, April 7, 67; Rio Piedras, April 21, 22, 69.

88. ENDOPHYLLOIDES PORTORICENSIS Whetzel & Olive (*Aecidium expansum* Arth., not *A. expansum* Diet.).

ON CARDUACEAE:

Mikania cordifolia (L. f.) Willd., Mayagüez, Feb. 29, March 29, 83; Maricao, March 16, 84; San German, April 1, 85; El Duque, April 19, 86.

Mikania odoratissima Urban, El Yunque, April 14, 73; El Duque, April 19, 74.

The material in the Stevens set was not sufficiently well studied to make out the true character of the sorus, and an erroneous determination was the consequence. The second host was not named in the Stevens list, although his no. 135, given as *Mikania* sp., has since been determined as *M. odoratissima*. The species has been found in the phanerogamic herbarium of the N. Y. Bot. Garden on *M. Stevensiana* Britton, Maricao river, P. R., Feb. 14, 1915, Britton & Cowell 4225, and on *M. scandens* (L.) Willd.,

Secanquim, Depart. Alta Verapaz, Guatemala, Jan. 11, 1905, *Maron & Hay* 3239, and Aspinwall, Panama, Oct. 1859, *Sutton Hays* 868.

89. PUCCINIOSIRA PALLIDULA (Speg.) Lagerh.

ON TILIACEAE:

Triumfetta semitriloba L., Mayagüez, Feb. 29, 1908, March 1-8, 1907; Maricao, March 7, 1905; Yauco, March 31, 1906.

90. BOTRYORHIZA HIPPOCRATEAE Whetzel & Olive, Am. Jour. Bot. 4: 47. 1917.

ON HIPPOCRATEACEAE:

Hippocratea volubilis L., Mayagüez, March 1, 3, 27, 87, March 7, 88, March 9, 89; Barceloneta, April 6, 90; Rio Piedras, April 4, 21, 91; El Yunque, April 12, 92.

The structure of this rust is in many ways quite aberrant. No other telial form is known having a *Uredo*-like sorus. The white, conidia-like spores, produced in great abundance, remind one of certain phycomycetous fungi. The grouping of the sori on small hypertrophied areas, or uniformly over much drawn and etiolated shoots, agrees well with some rusts, *i. e.*, the short cycle *Puccinia obliqua* on asclepiads, or the aecia of *Puccinia Rivinae*. The careful and conclusive studies by Messrs. Whetzel and Olive warrant us in believing this to be a genuine rust. Its further study and the search for related forms are likely to give another, and possibly new, angle from which to interpret the evolution of the Uredinales.

Form-genus: **Aecidium**

All of the forms listed here probably belong to heteroecious species under *Aecidiaceae*. The spores of each form have been tested by the collectors and found to germinate in a moist atmosphere by the production of long hyphae without showing promycelial tendency.

91. AECIDIUM PASSIFLORICOLA P. Henn.

ON PASSIFLORACEAE:

Passiflora rubra L., Mayagüez, March 8, 59; Maricao, March 16, 60.

The germination of this rust was tested by Messrs. Whetzel and Olive in moist air on a solid substratum and found to produce the usual indeterminate hyphal growth of genuine aecia. In a number of instances they found the rust in the field so intimately associated with a telial rust on *Scleria pterota* as to strongly suggest their genetic connection.

The rust has also been found in Jamaica by L. M. Underwood, at Castleton, no. 82, Linstead, no. 1746, and Cockpit county, no. 3316. It also is known from South America, having been collected in Peru by E. Ule, on *Passiflora tricuspidis*, no. 3235.

92. *AECIDIUM TOURNEFORTIAE* P. Henn.

ON BORAGINACEAE:

Tournefortia bicolor Sw., Barceloneta, April 8, 64.

Tournefortia microphylla Bert., Yauco, March 30, 312.

The two hosts listed are new for the rust. The only previous North American collections were by Prof. Stevens at two localities in Porto Rico on *T. hirsutissima*.

93. *AECIDIUM TUBULOSUM* Pat. & Gaill.

ON SOLANACEAE:

Solanum torvum Sw., Mayagüez, March 6, 58; Maricao, March 15, 56; Utuado, April 7, 57.

Field evidence suggests the possible connection of this form with *Puccinia substriata*, no. 46.

94. *AECIDIUM ABSCEDENS* Arth.

ON RUBIACEAE:

Randia aculeata L., Barceloneta, April 5, 6, 61; Campo Allegra, April 21, 62.

95. *AECIDIUM BORRERIAE* Pat.

ON RUBIACEAE:

Hemidiodia ocimifolia (Willd.) K. Schum., Mayagüez, March 6, 169a, El Yunque, April 14, 279.

Form-genus: **Uredo**

Paraphyses imbricated to form a pseudoperidium, or with cells united into a peridial membrane, mostly forms belonging to Uredinaceae, Nos. 96 to 102. Paraphyses absent, or if present, free and peripheral, mostly forms belonging to Aecidiaceae, Nos. 103 to 122.

96. *UREDIO GLOBULOSA* Arth.

ON AMARYLLIDACEAE:

Hypoxis decumbens L., Maricao, March 23, 313; Añasco, March 28, 448.

The first collection of this species in Porto Rico was made at Rio Piedras, March 14, 1911, by J. R. Johnston.

97. *UREDIO COCCOLOBAE* P. Henn. Hedw. 35: 253. 1896.

ON POLYGONACEAE:

Coccoloba uvifera L., Mayagüez, March 3, 342; Boqueron, March 11, 343; San German, April 1, 344.

The large, leathery leaves of the host are abundantly besprinkled with the punctiform sori, to some extent on both sides, but especially beneath. The fungus produces scarcely any discoloration, except to give a rusty appearance to the surface, due to the reddish-brown tissue closely surrounding the sori.

The spores are ellipsoid, 21-24 by 29-37 μ ; wall 1-1.5 μ , thick, pale yellow or nearly colorless, finely and closely echinulate, pores obscure. The sorus is subepidermal, surrounded by colorless, clavate paraphyses, which are imbricated into a pseudoperidium. The sorus opens by a central pore.

This is the first collection of the species from North America. The type was on *C. populifolia* Wedd., from Brazil.

98. *Uredo notata* sp. nov.

ON MALPIGHIACEAE:

Byrsonima crassifolia H. B. K., Mayagüez, March 7, 333.

Uredinia hypophyllous, scattered or somewhat in groups, bulate, 0.1-0.4 mm. across, fuscous, subepidermal, opening by a central pore; pseudoperidium of imbricated paraphyses, the free portion of each one cylindrical, bluntly rounded at the end, or sometimes acuminate and pointed, 9-15 μ in diameter, the free part 75-115 μ long, the wall colorless, thickened to leave the lumen scarcely visible; urediniospores ellipsoid or broadly obovoid, borne singly, 23-30 by 35-50 μ ; wall golden-brown, moderately thick, 2-4 μ , sometimes thicker above, 3-7 μ , strongly and sparsely echinulate.

The spores much resemble those of *Uredo uberabensis* P. Henn., from Brazil, on some undetermined species of *Byrsonima*, but are considerably larger. The conspicuous pseudoperidium

appears to be absent from the Brazilian form, at least it is not mentioned in the original description, and could not be seen in the material at hand (Ule, 2005). About the same differences also maintain between the Porto Rican material and the description of the uredinia of *Cronartium Byrsonimatis* P. Henn., which was collected in Brazil by Puttemans on *Byrsonima coccolobifolia*, of which I have seen no specimen. The resemblance, however, is sufficiently good to indicate that the present form probably belongs to *Cronartium*.

99. **Uredo Trichiliae** sp. nov.

ON MELIACEAE:

Trichilia pallida Sw., Maricao, along Rio Grande, March 24, 63.

Uredinia caulicolous, on etiolated shoots, or on midrib and veins, oblong or linear, 0.5–3.5 mm. long, numerous, subepidermal, soon naked, pulverulent, bright yellow, ruptured epidermis evident; peridium and paraphyses none; urediniospores borne singly on pedicels, obovoid or ellipsoid, small, 13–15 by 16–23 μ ; wall colorless or nearly so, thin, 1–1.5 μ , closely and finely echinulate, the pores obscure.

A rust of unusual appearance, whose affinities are not evident. The form of the sorus and character of the spores suggest *Kuehneola* more than they do *Puccinia* or *Uromyces*. No pycnia or telia could be found. The effect upon the host is similar to that produced by many aecia.

100. **UREDIO JATROPHICOLA** Arth.

ON EUPHORBIACEAE:

Jatropha gossypifolia L., Yauco, March 31, 241; Tanamá River Valley, April 7, 240; Rio Piedras, April 10, 239.

The paraphyses in this species are sometimes poorly developed, and in the usual free-hand sections may appear to be and possibly are absent. Usually, however, they form a strong pseudoperidium, although individually small. In these respects they behave like the similar paraphysoid structure in the uredinia of the common *Ficus* rust.

101. *Uredo Clusiae* sp. nov.

ON GUTTIFERAE:

Clusia rosea Jacq., Maricao, mountains along Rio Grande,
March 22, 371.

Uredinia hypophyllous, scattered, mammilliform, 0.3–0.6 mm. across, dark brown, opening by a central pore or rupture, sub-epidermal, deep-seated; urediniospores obovoid or ellipsoid, 19–23 by 28–35 μ ; wall light yellow, about 1.5 μ thick, sparsely and strongly echinulate, the points being 1–2 μ long and about 3 μ apart.

The large thick leaves of the host readily show the numerous sori. Sections show that the sorus is formed well down in the tissues, apparently below one or more layers of the mesophyll underneath the epidermis. It was not possible to be quite certain about a peridium, but there may be one having rhomboidal cells, that are verrucose on the inner side. The spores have a conspicuous echinulation, which with the absence of demonstrable pores and the general character of the sorus indicates a possible relationship to *Cronartium*.

102. *UREDO BIXAE* Arth.

ON BIXACEAE:

Bixa Orellana L., Maricao, March 25, 326.

The paraphysate structure has not been well made out in the species, but appears to be an imbricated pseudoperidium.

103. *UREDO GYMNOGRAMMES* P. Henn.

ON POLYPODIACEAE:

Adiantum latifolium Lam., Mayagüez, March 6, 2, March 10, 3.

Dryopteris mollis (Jacq.) Huron, Mayagüez, March 6, 4.

Dryopteris Poiteana (Bory) Urban, Mayagüez, March 6, 7, March 13, 8, March 20, 9; Maricao, March 24, 10.

Gomiopteris guadalupensis Fee, Mayagüez, March 3, 1.

Pityrogramma calomelaena (L.) Link, Maricao, March 16, 5.

Tectaria Marteniensis (Spreng.) Copel, Mayagüez, March 6, 6.

The species is known also from Cuba and Jamaica. The first,

second and fourth hosts are now reported for the first time. It is evident that the rust may be found upon many species and genera of ferns, and is doubtless common and widespread.

104. *UREDOPASPALICOLA* P. Henn. (*U. Stevensiana* Arth.).

ON POACEAE:

Axonopus compressus (Sw.) Beauv., Mayagüez, March 8, 412.

Bambos vulgaris Schrad., Maricao, March 15, 428, 429; Mayagüez, March 20, 427.

Paspalum conjugatum Berg., Mayagüez, Feb. 29, 413, March 2, 410; Maricao, March 25, 417.

Paspalum plicatulum Michx., Añasco, March 28, 419.

With the increase of material and more extended study given this rust since publication of *Uredo Stevensiana* (MYCOL. 7: 326. 1915) it has been found that the presence or absence of paraphyses in the sorus is a variable character. Examined by scraped mounts paraphyses often seem absent, when careful sections show them to be present. Different sori possess paraphyses in varying number and prominence. There appear to be all gradations between non-paraphysate and conspicuously paraphysate sori. The two forms are consequently here united.

The urediniospores of this form are indistinguishable from those of *Puccinia deformata* Berk. & Curt., on *Olyra latifolia*, but the latter are usually accompanied by teliospores. Such delicate, colorless spores give few characters by which they can be separated. It seems best to maintain *Uredo paspalicola* as a distinct form until suitable teliospores are found to rightly show its affinities.

In the Stevens list (MYCOL. 8: 21) a collection on *Oplismenus hirtellus* was referred to the South American *Uredo Olyrae* P. Henn. A more detailed study of the material has since shown that it properly belongs under *U. paspalicola*.

105. *UREDOPALLIDA* Diet. & Holw. Bot. Gaz. 24: 37. 1897.

ON POACEAE:

Zea Mays L., Naguabo on slope of El Duque, April 19, 440.

A new host for this rust, which has heretofore been known

only from Mexico and Central America and only on *Tripsacum lanceolatum* Rupr. The credit for its discovery should be given to Mr. J. A. Stevenson, who first detected it in company with Dr. Olive.

106. UREDO DICHROMENAE Arth.

ON CYPERACEAE:

Dichromena ciliata Vahl, Mayagüez, March 27, 44; Naguabo on slope of El Duque, April 19, 46; Rio Piedras, April 22, 45.

Dichromena radicans Cham. & Schl., Mayagüez, March 8, 50; Maricao, March 23, 49; Añasco, March 28, 48; El Yunque, April 12, 51; Naguabo on slope of El Duque, April 19, 47.

107. UREDO FUIRENAE P. Henn.

ON CYPERACEAE:

Fuirena umbellata Rottb., El Yunque, April 12, 28; Naguabo along railroad, April 19, 27.

Fuirena sp., Naguabo on slope of El Duque, April 19, 442.

108. UREDO SUPERIOR Arth.

ON CYPERACEAE:

Fimbristylis ferruginea (L.) Vahl, Martin Peña, April 10, 23.

Fimbristylis spadicea (L.) Vahl, Mayagüez, road to Guanajibos, March 3, 24.

Heretofore only the type collection of this species was known. It was collected near Ponce, on *F. spadicea*, Dec. 12, 1902, by A. A. Heller 6279. The urediniospores of this species are much larger and thicker-walled than are those of *Puccinia Fimbristylidis*.

The present collection on *F. ferruginea*, as well as the two collections previously recorded in the Stevens list, do not have urediniospores as uniformly large and thick-walled as those on *F. spadicea*, but all the material in hand shows so much greater resemblance to this species than to *P. Fimbristylidis*, that it is transferred here pending the finding of teliospores.

109. UREDO DIOSCOREAE P. Henn.

ON DIOSCOREACEAE:

Dioscorea polygonoides H. & B., El Yunque, April 12, 320.

Rajania cordata L., Maricao, March 22, 316, 319; Tanamá River Valley, April 7, 315; Barceloneta, April 8, 317; El Yunque, April 12, 318.

The first named host is new for the rust. All the collections here listed show a uniform appearance of the uredinia and urediniospores, agreeing with those of previous Porto Rican and Cuban collections.

110. UREDO HELICONIAE Diet.

ON SCITAMINEAE:

Bihai borinquena Griggs, El Yunque, April 12, 221.

This is the first report of the rust for Porto Rico. It was collected in 1913 by Prof. F. L. Stevens in Martinique. The host is a new one for the species.

111. UREDO GYNANDREARUM Corda.

ON ORCHIDACEAE:

Prescottia oligantha (Sw.) Lindl., Maricao, March 16, 314.

This collection gives a new host for this rust. The rust was found on *Habenaria* sp., now determined as *H. maculosa* Lindl., at Bayamon, P. R., Jan. 11, 1899, A. A. Heller 118.

112. UREDO HYMENAEAE Mayor.

ON CAESALPINIACEAE:

Hymenaea Courbaril L., Fajardo, April 20, 175; Campo Allegra, April 21, 176; Coamo, April 23, 174; Mayagüez, March 6, 177, March 13, 178.

113. UREDO LUTEA Arth.

ON CAESALPINIACEAE:

Cassia quinquangulata L. C. Rich., Maricao, March 16, 179; El Yunque, April 14, 180.

114. UREDO CABRERIANA Kern & Kellerm.

ON FABACEAE:

Erythrina glauca Willd., Rio Piedras, April 11, 173.

115. UREDO SAUVAGESIAE Arth.

ON OCHNACEAE:

Sauvagesia erecta L., El Yunque, April 12, 231.

116. UREDO CUPHEAE P. Henn.

ON LYTHRACEAE:

Cuphea Parsonsia R. Br., Mayagüez, March 7, 302;
Maricao, March 16, 23, 301; Añasco, March 28, 300.

117. Uredo Operculinae sp. nov.

ON CONVULVULACEAE:

Operculina dissecta (Jacq.) House (*Convolvulus dissectus*
Jacq.), Yauco, along railroad east, March 31, 310.

Uredinia hypophyllous, in small crowded groups on slightly discolored spots, or scattered singly, subepidermal, bullate, opening by a small rupture of the overarching epidermis, without paraphyses or peridium; urediniospores globose, or broadly obovoid, 14–23 by 23–29 μ ; wall thin, about 1 μ , rarely a little more, finely and closely echinulate, pale brownish or nearly colorless, the pores not discernable.

The unusual form of the sorus, and the pale, thin-walled spores, distinguish this rust from previously described species on this family of hosts.

118. UREDO HAMELIAE Arth.

ON RUBIACEAE:

Hamelia erecta Jacq., Yauco, base of hills two miles east,
March 31, 351.

119. UREDO SABICEICOLA Arth.

ON RUBIACEAE:

Sabicea aspera Aubl., Mayagüez, March 1, 236, March 10,
235; Maricao, March 23, 237.

120. UREDO PROXIMELLA Arth.

ON CICHORIACEAE:

Lactuca intybacea Jacq., Barceloneta, April 7, 134.121. UREDO PLUCHEAE Syd. (*U. biocellata* Arth.).

ON CARDUACEAE:

Pluchea purpurascens (Sw.) DC., Mayagüez, south along
railroad, March 3, May 3, i, II, 156.

Since the publication of the Porto Rican list of rusts, attention has been called to the prior publication of *Uredo Pluchae* Syd., as a name for this rust, and Dr. H. Sydow has kindly sent me a part of the type for examination.

The present collection is also accompanied by aecia, which may or may not be genetically connected with the uredinia. The aecial infection shows as purplish spots, 3-5 mm. across, with pale centers, on the under side of which only a few, small, pale aecia were found. Upon making sections the fragile peridium was disclosed, not extending above the leaf surface. The peridial cells are rhomboidal, slightly overlapping, about 15 by 26 μ , the outer wall smooth, about 3 μ thick, the inner wall verrucose, thin, about 1.5 μ thick. The aeciospores are globoid, 14-19 μ in diameter, the wall thin, 1 μ , colorless, minutely and inconspicuously verrucose.

122. *UREDO SPARGANOPHORI* P. Henn.

ON CARDUACEAE:

Struchium Sparganophorum (L.) Kuntze, Mayagüez, March 6, 169, March 8, 170, March 13, 171, March 27, 172.

A collection was made by J. R. Johnston at Carolina, P. R., Feb. 18, 1914, II, 1416.

The uredinia of this form are amphigenous, with the grouping somewhat different on the two sides of the leaf. Beneath they are usually scattered, while above they form cespitosely pulvinate groups. The sorus and spores from the two sides, however, do not appear unlike.

SPECIES PREVIOUSLY REPORTED FROM PORTO RICO, NOT IN THE
ABOVE LIST

- 123. *MILEZIA COLUMBIENSIS* (Dietel) Arth., on *Nephrolepis rivularis* (*Polypodiaceae*), Stevens.
- 124. *RAVENELIA CEBIL* Speg., on *Piptadenia peregrina* (*Caesalpinaceae*), Stevens.
- 125. *RAVENELIA PORTORICENSIS* Arth., on *Cassia emarginata* (*Caesalpinaceae*) Heller.
- 126. *RAVENELIA CASSIAECOLA* Atks., on *Chamaecrista Aeschynomene* (*Caesalpinaceae*), Stevens.

127. RAVENELIA CAULICOLA Arth., on *Cracca cinerea* (Fabaceae), Stevens, Johnston & Seaver.
128. TRANZSCHELIA PUNCTATA (Pers.) Arth., on *Amygdalus persica* (Amygdalaceae), Earle.
129. ARGOMYCES INSULANS Arth., on *Vernonia albicaulis* and *V. longifolia* (Carduaceae), Stevens.
130. UROMYCES COMMELINAE (Speg.) Cooke, on *Commelina virginica* (Commelinaceae), Stevens.
131. UROMYCES JAMAICENSIS Vesterg., on *Bauhinia pauletia* (Fabaceae), Stevens, Holway.
132. UROMYCES COLOGANIAE Arth., on *Teramnus uncinatus* (Fabaceae), Holway.
133. UROMYCES JANIPHAEE (Wint.) Arth., on *Manihot Manihot* (Euphorbiaceae), Stevens.
134. UROMYCES GEMMATUS Berk. & Curt., on *Jacquemontia nodiflora* (Convolvulaceae), Stevens, Holway.
135. PUCCINIA CAMELIAE Mayor, on *Chaetochloa setosa* (Poaceae) Stevens.
136. PUCCINIA SCIRPI DC., on *Scirpus lacustris* (Cyperaceae), Heller.
137. PUCCINIA SCLERICOLA Arth., on *Scleria* sp. (Cyperaceae), Stevens. The specimens on *S. hirtella* placed here in the Stevens list must be considered doubtful.
138. PUCCINIA MACROPODA Speg., on *Iresine elatior* (Amarantaceae), Stevens.
139. PUCCINIA EUPHORBIAE P. Henn., on *Aklema petiolaris* (Euphorbiaceae), Stevens.
140. PUCCINIA CRASSIPES Berk. & Curt., on *Ipomoea triloba* (Convolvulaceae), Stevens, Johnston.
141. PUCCINIA CORDIAE Arth., on *Cordia alliodora* (Ehretiaceae), Holway.
142. PUCCINIA XANTHII Schw., on *Xanthium longirostre* (Ambrosiaceae), Britton & Cowell, Johnston.
143. AECIDIUM FAVACEUM Arth., on *Phyllanthus nobilis* (Euphorbiaceae), Stevens.
144. UREDO VENUSTULA Arth., on *Andropogon brevifolius* (Poaceae), Stevens.

145. UREDO ANTHURII Hariot, on *Anthurium scandens* (Ara-
ceae), Stevens.
146. UREDO COMMELYNEAE Kalchbr., on *Commelina virginica*
(Commelinaceae), Stevens.
147. UREDO NIGROPUNCTATA P. Henn., on *Bletia patula* (Orchid-
aceae), Stevens.
148. UREDO PUSTULATA P. Henn., on *Stenorrhynchus lanceolatus*
(Orchidaceae), Stevens.
149. UREDO GUACAE Mayor, on *Epidendrum difforme* (Or-
chidaceae), Stevens, and *E. rigidum*, Holway.
150. UREDO PIPERIS P. Henn., on *Peperomia hermandifolia*
(Piperaceae), Stevens.
151. UREDO ARTOCARPI B. & Br., on *Artocarpus communis* (Arto-
carpaceae), Clinton.
152. UREDO RUBESCENS Arth., on *Dorstenia Contrajerva* (Arto-
carpaceae), Stevens.
153. UREDO AESCHYNOMENIS Arth., on *Aeschynomene ameri-
cana* (Fabaceae), Stevens.
154. UREDO ARACHIDIS Lagerh., on *Arachis hypogea* (Fabaceae),
Stevens.
155. UREDO ERYTHROXYLONIS Graz., on *Erythroxylon areolatum*
(Erythroxylonaceae), Stevens.
156. UREDO GOUANIAE Ellis & Kelsey, on *Gouania lupuloides* and
G. polygama (Frangulaceae), Stevens.
157. UREDO VICINA Arth., on *Wedelia lanceolata* (Carduaceae),
Stevens.

INDEX TO UREDINALES

New and newly combined names are in **bold-faced** type.

Aecidium abscedens, 94	Botryorhiza Hippocrateae, 90
Borreriae, 95	Bullaria Gouaniae , 61
circumscriptum, 84	
decoloratum, 86	Cerotelium Canavaliae, 12
expansum, 88	
favaceum, 143	Coleosporium Elephantopidis, 1
passifloriicola, 49, 91	Ipomoeae, 2
simplicior, 76	Plumierae, 3
Tournefortiae, 92	
tubulosum, 46, 93	Cronartium Byrsonimatis, 98
Wedeliae, 87	
Argomyces insulans, 129	Dietelia Canavaliae, 12
Vernoniae, 22	portoricensis, 88

- Endophyllum circumscriptum*, 84
decoloratum, 86
Stachytarphetae, 85
Wedeliae, 87
- Kuehneola Fici*, 9
Gossypii, 10
malvicola, 11
- Milesia columbiensis*, 123
- Olivea capituliformis*, 7
Petitiae, 8
- Physopella concors*, 6
Meibomia, 5
Vitis, 4
- Prospodium appendiculatum*, 20
plagiopus, 21
- Puccinia aequinoctialis*, 76
appendiculata, 20
angustatoidea, 26, 48
Arechavelatae, 60
Blechi, 77
Cameliae, 135
canaliculata, 47
Cannae, 54
Cenchri, 43
Cladii, 51
concrescens, 65
Cordia, 141
crassipes, 140
cuticulosa, 76
Cynodontis, 42
deformata, 104
Eleocharidis, 50
Euphorbiae, 139
fallaciosa, 78
farinacea, 75
Fimbristylidis, 52, 108
Gouaniae, 61
heterospora, 62
Huberi, 44
Hydrocotyles, 64
Hyptidis, 72
inflata, 59
instititia, 73
- Lantanae*, 68
lateritia, 79
Leonotidis, 70
levis, 45
Lithospermi, 67
macropoda, 138
medellinensis, 71
obliqua, 66
Ormosiae, 58
Polygoni-amphibii, 55
Psidii, 63
Psychotriae, 78
purpurea, 41
Puttemansii, 44
Rivinae, 56
Romagnoliana, 47
rosea, 80
salviicola, 74
Scirpi, 136
Scleriae, 27, 29
scleriicola, 49, 137
Smilacis, 53
Spegazzini, 82
substriata, 46, 93
Synedrellae, 83
tagetica, 81
Urbaniana, 69
Xanthii, 142
Zorniae, 57
- Puccinosira pallidula*, 89
- Ravenelia Caesalpiniae*, 19
capituliformis, 7
cassiaeicola, 126
caulicola, 127
Cebil, 124
Indigoferae, 14
Ingae, 15
portoricensis, 125
siliquae, 18
Stevensii, 17
Whetzellii, 16
- Rostrupia Scleriae*, 49
- Schroeteria aster fenestralis*, 13
- Tranzschelia punctata*, 128

Uredo Adenocalymnatis, 76

Aeschynomenis, 153

Anthurii, 145

Arachidis, 154

Artocarpus, 151

bidenticola, 38

biocellata, 121

Bixae, 102

Cabreriana, 114

capituliformis, 7

Clusiae, 101

Coccolobae, 97

Commelyneae, 146

concors, 6

Cupheae, 116

cuticulosa, 76

Desmodii-tortuosi, 30

Dichromenae, 106

Dioscoreae, 109

Erythroxylois, 155

excipulata, 16

fallaciosa, 78

Fuirenae, 107

globulosa, 96

Gouaniae, 156

Guacae, 149

Gymnogrammes, 103

gynandrearum, 111

Hameliae, 118

Heliconiae, 110

Hymenaeae, 112

jatrophiicola, 100

lutea, 113

nigropunctata, 147

notata, 98

Olyrae, 104

Operculinae, 117

Palicoureae, 78

pallida, 105

paspalicola, 104

Piperis, 150

Plucheae, 121

proximella, 120

psychotriicola, 78

pustulata, 148

rubescens, 152

sabiceicola, 119

Sauvagesiae, 115

Sparganophori, 122

Stevensiana, 104

superior, 52, 108

Trichiliae, 99

uberabensis, 98

venustula, 144

vicina, 157

Zorniae, 57

Uromyces appendiculatus, 28**bidenticola**, 38

Bidentis, 38, 39

Caesalpiniae, 19

Cestri, 35

Cologaniae, 132

columbianus, 37

Commelinae, 130

densus, 39

Dolicholi, 29

Eragrostidis, 23

gemmatus, 134

Hedysari-paniculati, 30

Hellerianus, 36

Howei, 34

ignobilis, 25

jamaicensis, 131

Janiphae, 133

leptodermus, 24

Neurocarpi, 32

Pavoniae, 62

pianhyensis, 40

proeminens, 33

psychotriacae, 78

Rhyncosporae, 26, 48

Sabineae, 31

Scleriae, 27

*Host Index**Acacia Farnesiana*, 18

riparia, 17

Acanthaceae, 77*Adiantum latifolium*, 103*Aeschynomene americana*, 153*Ageratum conyzoides*, 80*Aklema petiolaris*, 139*Alchornea latifolia*, 7*Amarantaceae*, 138*Amaryllidaceae*, 96

- Ambrosiaceae, 142
 Ammiaceae, 64
 Amygdalaceae, 128
 Amygdalus persica, 128
 Andropogon brevifolius, 144
 Anthurium scandens, 145
 Apocynaceae, 3
 Araceae, 145
 Arachis hypogea, 154
 Artocarpaceae, 9, 151, 152
 Artocarpus communis, 151
 Asclepiadaceae, 34, 65, 66
 Asclepias curassavica, 34, 65
 nivea, 65
 Axonopus compressus, 104
- Bambos vulgaris, 104
 Bauhinia pauletia, 131
 Bidens leucantha, 38
 pilosa, 38, 39
 Bignonia aequinoctialis, 76
 Bignoniaceae, 20, 21, 76
 Bihai borinquena, 110
 Bixa Orellana, 102
 Bixaceae, 102
 Blechum Brownei, 77
 Bletia patula, 147
 Boraginaceae, 92
 Borreria levis, 79
 verticillata, 79
 Byrsonima coccolobifera, 98
 crassifolia, 98
- Caesalpiniaceae, 112, 113, 124, 125,
 126
 Cajan Cajan, 29
 Cajanus Cajan, 29
 indicus, 29
 Canavalia ensiformis, 12
 Canna coccinea, 54
 Cannaceae, 54
 Capriola dactylon, 42
 Cardiospermum microcarpum, 60
 Carduaceae, 1, 22, 37, 38, 39, 40, 80,
 81, 82, 83, 86, 87, 88, 121, 122,
 129, 157
 Carica Papaya, 9
 Cassia emarginata, 125
 quinquangulata, 113
 Cayaponia racemosa, 36
- Cenchrus echinatus, 43
 Cestrum laurifolium, 35
 macrophyllum, 35
 Chaetochloa geniculata, 46
 imberbis, 46
 setosa, 135
 Chamaecrista Aeschynomene, 126
 Chamaesyce brasiliensis, 33
 hirta, 33
 prostrata, 33
 Cicca disticha, 13
 Cichoriaceae, 120
 Cissus sicyoides, 84
 Cladium effusum, 51
 Clibadium erosum, 86
 Clitoria rubiginosa, 32
 Clusia rosea, 101
 Coccoloba populifera, 97
 uvifera, 97
 Commelina virginica, 130, 146
 Commelinaceae, 130, 146
 Convolvulaceae, 2, 67, 117, 134, 140
 Convolvulus dissectus, 117
 Cordia alliodora, 141
 Cracca cinerea, 127
 Cuphea Parsonsia, 116
 Cucurbitaceae, 36
 Cydista aequinoctialis, 76
 Cynodon dactylon, 42
 Cyperaceae, 26, 27, 47, 48, 49, 50, 51,
 52, 106, 107, 108, 136, 137
 Cyperus ferax, 47
 giganteus, 47
 laevigatus, 47
 odoratus, 47
 radiatus, 47
 reticulatus, 47
 sphacelatus, 47
 surinamensis, 47
- Desmodium heterocarpum, 5
 Scorpiurus, 30
 supinum, 5
 tortuosum, 30
 Dichromena ciliata, 106
 radicans, 106
 Diodia littoralis, 79
 maritima, 79
 rigida, 79
 Dioscorea polygonoides, 109

- Dioscoreaceae, 109
 Dolicholus eninimus, 29
 Lablab, 6
 reticulatus, 29
 Dorstenia contrajerva, 152
 Dryopteris mollis, 103
 Poiteana, 103

 Ehretiaceae, 141
 Eleocharis capitata, 50
 geniculata, 50
 interstincta, 50
 mutata, 50
 Elephantopus mollis, 1
 Emilia sonchifolia, 83
 Epidendrum difforme, 149
 rigidum, 149
 Eragrostis tephrosanthes, 23
 Eriochloa subglabra, 46
 Erythrina glauca, 114
 Erythroxyton areolatum, 155
 Erythroxytonaceae, 155
 Eugenia Jambos, 63
 Euphorbia brasiliensis, 33
 hirta, 33
 pilulifera, 33
 prostrata, 33
 Euphorbiaceae, 7, 13, 33, 100, 133,
 139, 143
 Evolvulus nummularis, 67
 pilosus, 67

 Fabaceae, 5, 6, 12, 14, 28, 29, 30, 31,
 32, 57, 58, 114, 127, 131, 132, 153,
 154
 Ficus Carica, 9
 crassinervia, 9
 laevigata, 9
 lentiginosa, 9
 Fimbristylis diphylla, 52
 ferruginea, 52, 108
 polymorpha, 52
 spadicea, 108
 Frangulaceae, 61, 156
 Fuirena umbellata, 107

 Gomiopteris guadalupensis, 103
 Gossypium hirsutum, 10
 Gouania lupuloides, 61, 156
 Gouania polygama, 61, 156
 Guttiferae, 101

 Hamelia erecta, 118
 Hemidiodia ocimifolia, 95
 Hippocratea volubilis, 90
 Hippocrateaceae, 90
 Holcus sudanensis, 41
 Hydrocotyle umbellata, 64
 Hymenaea Courbaril, 112
 Hypoxis decumbens, 96
 Hyptis atrorubens, 71
 capitata, 72
 latanifolia, 73
 pectinata, 71
 suaveolens, 71

 Ichnanthus pallens, 46
 Indigofera Anil, 14
 suffruticosa, 14
 Inga Inicuil, 16
 laurina, 15
 pachycarpa, 16
 vera, 16
 Ipomoea angustifolia, 2
 Batatis, 2
 rubra, 2
 stolonifer, 2
 triloba, 140
 Iresine elatior, 138

 Jacquemontia nodiflora, 134
 tamnifolia, 2
 Jambos Jambos, 63
 Jambosa Jambos, 63
 Jatropha gossypifolia, 100

 Kyllinga brevifolia, 47
 pumila, 47

 Labiatae, 70, 71, 72, 73, 74, 75
 Lactuca intybacea, 120
 Lamiaceae, 70, 71, 72, 73, 74, 75
 Lantana involucrata, 68
 Lasiacis ligulata, 24
 Swartziana, 24
 Leonotis nepetaefolia, 70
 Lythraceae, 116

- Malache scabra*, 11, 62
Malpighiaceae, 59, 98
Malvaceae, 10, 11, 62
Manihot Manihot, 133
Mariscus jamaicensis, 51
Meibomia Scorpiurus, 30
 supina, 5
 tortuosa, 30
Melanthera canescens, 37
Meliaceae, 99
Melothria guadalupensis, 36
Mesosphaerum atrorubens, 71
 capitatum, 72
 latanifolium, 73
 pectinata, 71
 suaveolens, 71
Metastelma lineare, 66
 parviflorum, 66
Mikania cordifolia, 88
 odoratissima, 88
 scandens, 82
Mimosa ceratonia, 19
Mimosaceae, 15, 16, 17, 18, 19
Myrtaceae, 63

Nephrolepis rivularis, 123

Ochnaceae, 115
Olyra latifolia, 104
Operculina dissecta, 117
Opismenus hirtellus, 104
Orchidaceae, 111, 147, 148, 149
Ormosia Krugii, 58

Palicourea crocea, 78
 riparia, 78
Panicum fasciculatum, 44
 pallens, 46
 parvifolium, 24
 trichoides, 44
Paspalum conjugatum, 104
 fimbriatum, 45
 millegrana, 45
 paniculatum, 46
 plicatulum, 104
Passiflora rubra, 49, 91
 tricuspidis, 91
Passifloriaceae, 91
Pavonia racemosa, 11, 62
 spicata, 62

Peperomia hermandifolia, 150
Persicaria punctata, 55
Petitia domingensis, 8
Petiveriaceae, 56
Phaseolus adenanthus, 28
 lathyroides, 28
 vulgaris, 28
Phyllanthus distichus, 13
 grandiflorus, 13
 Niruri, 13
 nobilis, 143
Phytolaccaceae, 56
Piperaceae, 150
Piptadenia peregrina, 124
Pityrogramma calomelaena, 103
Pluchea purpurascens, 121
Plumiera alba, 3
Poaceae, 23, 24, 25, 41, 42, 43, 44, 45,
 46, 104, 105, 135, 144
Polygonaceae, 55, 97
Polygonum punctatum, 55
Polypodiaceae, 103, 123
Prescottia oligantha, 111
Psychotria patens, 78

Rajania cordata, 109
Randia aculeata, 94
Rhamnaceae, 61
Rivina humilis, 56
 octandra, 56
Rubiaceae, 78, 79, 94, 95, 118, 119
Rynchospora aurea, 26, 48
 corniculata, 48
 corymbosa, 48
 cyperoides, 26, 48
 distans, 26
 setacea, 26

Sabicea aspera, 119
Sabinea punicea, 31
Salvia coccinea, 75
 occidentalis, 74
Sapindaceae, 60
Sauvagesia erecta, 115
Scirpus lacustris, 136
Scitamineae, 110
Scleria canescens, 27
 cubensis, 49
 hirtella, 49, 137
 pterota, 27, 49, 91

- Sida hederifolia*, 62
 humilis, 62
 procumbens, 62
 urens, 62
Smilacaceae, 53
Smilax domingensis, 53
Solanaceae, 35, 93
Solanum torvum, 93
Sporobolus indicus, 25
Stenolobium Stans, 20
Stenorrhynchus lanceolatus, 148
Stigmaphyllon lingulatum, 59
Struchium Sparganophorum, 122
Synedrella nodiflora, 83
Syntherisma digitata, 46

Tagetes erecta, 81
Tecoma pentaphylla, 21
 Stans, 20
Tectaria Marteniensis, 103
Teramnus uncinatus, 132
Thalia geniculata, 54
Tiliaceae, 89
Tournefortia bicolor, 92
 hirsutissima, 92
 microphylla, 92
Trichilia pallida, 99
Trichostigma octandrum, 56
Tripsacum lanceolatum, 105

Triumfetta semitriloba, 89

Umbelliferae, 64

Vachellia Farnesiana, 18
Valerianodes cayennensis, 85
 dichotoma, 85
 jamaicensis, 69
 strigosa, 69
Valota insularis, 46
Verbenaceae, 8, 68, 69, 85
Vernonia albicaulis, 129
 borinquensis, 22
 longifolia, 129
 phyllostachya, 22
 sericea, 22
Vigna repens, 28
Vitaceae, 4, 84
Vitis vinifera, 4

Wedelia lanceolata, 157
 reticulata, 40
 trilobata, 87

Xanthium longirostre, 142

Zea Mays, 105
Zernia diphylla, 57

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